

# 802.11ac Wireless LAN FAQ

## Frequently Asked Questions about 802.11ac Wireless LAN technology

### What is 802.11ac?

802.11 is a set of Wireless Local Area Network (WLAN) standards maintained by the Institute of Electrical and Electronics Engineers (IEEE). The original 802.11 standard was released in 1997 and enabled data rates of only 2 Mbps in the 2.4 GHz Radio Frequency (RF) spectrum. Since that time, several amendments have been made to the 802.11 standard, introducing more advanced technology features to ultimately enable higher throughput and increased range for wireless LAN clients.

802.11n was ratified in 2009 and is the latest ratified standard from the IEEE. 802.11n theoretically enables up to 600 Mbps of throughput per Access Point (AP) radio, with the current generation of APs supporting up to 450 Mbps of throughput per radio in both the 2.4 GHz and 5 GHz spectrums.

802.11ac extends on the 802.11n technology and will enable throughput of over 1Gbps per radio in the 5 GHz spectrum only.

### When will 802.11ac become a ratified standard?

Development of the 802.11ac standard commenced in 2008 and is still in draft form at this time. The IEEE expects the standard will be ratified in early 2014. As was the case with the 802.11n standard, client devices and APs will become available prior to ratification, based on the latest standard drafts.

### How fast will 802.11ac be?

The 802.11ac standard can theoretically support close to 7 Gbps of aggregate throughput per AP. As is the case with 802.11n however, the actual throughput achieved with 802.11ac will vary based on many factors, such as capabilities of the client and AP, as well as distance from the AP and signal strength. It is expected that the maximum association rate to the first phase of 802.11ac devices will be around 1.3 Gbps per radio, with up to 600 Mbps of total throughput for clients.

### How can 802.11ac achieve such high speeds?

802.11ac will introduce a number of technical advancements including, but not limited to:

- Wider RF channels (including channel binding)
  - 80 MHz channels and 160 MHz channels in 802.11ac, vs. 40 MHz maximum in 802.11n.
- Increased number of spatial streams
  - 802.11ac will support up to 8 spatial streams, vs. 4 spatial streams in 802.11n. Most 802.11ac APs will typically support 3 spatial streams however.
- Denser modulation
  - 802.11ac will support up to 256-QAM encoding, versus 64-QAM in 802.11n.

The denser modulation in 802.11ac is where much of the performance benefit is achieved. For example, clients connected within close proximity to an 802.11ac AP that is configured to use 40 MHz channels and 3 spatial streams, can achieve an

association rate of 600 Mbps. This is the same channel and stream configuration typically used in current 802.11n deployment, but with a 25% throughput increase. Increasing the channel width on an 802.11ac AP to 80 MHz will enable an association rate close to 1.3 Gbps, almost a 300% performance increase over 802.11n.

#### **Why does 802.11ac work at 5 GHz only?**

The primary reason that 802.11ac will only work in the 5 GHz band is that only this band have the available RF spectrum to support the extended channel width. Available RF spectrum varies based on the regulatory domain; however in the US for example, the 2.4 GHz RF spectrum only allows 3 non-overlapping 20 MHz channels. This is not enough to support the 80 MHz channel width required for 802.11ac; therefore the 5 GHz spectrum must be used. The 5 GHz spectrum in the US allows for 21 non-overlapping 20 MHz channels, or 4 non-overlapping 80 MHz 802.11ac channels.

#### **Do 802.11ac products require special certification or regulatory compliance?**

No. As long as your regulatory region allows RF in the 5 GHz band, there are no additional certifications needed for 802.11ac. Fortinet APs do operate in 5 GHz in regions where this is allowed.

#### **What is the difference between 802.11ac and 802.11ad?**

802.11ad is another multi-gigabit wireless communication standard, however 802.11ad operates in the 60 GHz unlicensed RF spectrum instead of 2.4 GHz or 5 GHz. Radios operating at 60 GHz have a shorter range than 2.4 GHz or 5 GHz radios. As such, 802.11ad will be used in scenarios that require high throughput over a very short distance, such as a wireless replacement for HDMI or USB cables, rather than wireless LAN scenarios.

#### **Do I need to buy new APs to support 802.11ac?**

Yes. 802.11ac will require a new physical radio design, which means that new hardware will be required. It will not be physically possible to upgrade existing 802.11n radios to support the new 802.11ac standard.

#### **When will Fortinet have 802.11ac APs?**

Subject to change, Fortinet expects to release the first 802.11ac products in Q4 of 2013. The first AP products released will be the FAP-322C (outdoor) and FAP-320C (indoor) devices. The access points will be dual-radio 802.11ac, with a 3x3 MIMO and triple stream. Each AP is capable of 1.7 Gbps of maximum association rate (1.3 Gbps on 5 GHz radio and 450 Mbps on 2.4 GHz radio).

#### **Will 4 stream 802.11n products be available before 802.11ac products?**

Even though the 802.11n standard supports a maximum of 4 spatial streams, most manufacturers (including Fortinet) will be unlikely to produce 4 stream 802.11n products. Instead, the focus will be on 802.11ac, which will include technology and features that exceed those of 4 stream 802.11n products.

#### **When will clients support 802.11ac?**

At this time, a limited number of clients currently support 802.11ac based on early 802.11ac chipsets, including some smart phones and other mobile devices. It is expected that the number of clients supporting 802.11ac will increase over time, and could even reach as much as 1 billion by 2015.

#### **Will I be able to use Fortinet 802.11ac and 802.11n APs in the same wireless LAN?**

Yes. As is the case today with 802.11b/g/n APs interoperating in the same wireless LAN as 802.11a/b/g/n APs (for example, using a Fortinet FAP-11C in the same network as FAP-221B), Fortinet 802.11ac access points will interoperate in the same wireless LAN as other Fortinet APs.

#### **Will 802.11a/b/g/n clients be compatible with 802.11ac APs?**

Yes, 802.11ac technology is backward compatible with previous wireless LAN technologies.

**Will my LAN be able to support 802.11ac?**

802.11ac begins closing the gap between wired and wireless LAN throughput, and in some cases, 802.11ac may operate at a higher speed than legacy 100Mbit Fast Ethernet wired switch ports. Even early 802.11ac products are likely to support 3 spatial streams and 80 MHz channels, putting theoretical wireless LAN throughput at around 1.3 Gbps. Once the overhead associated with wireless networks are taken into consideration, the realistic real-world throughput will still clearly exceed the capacity of legacy 100Mbit Fast Ethernet switches, and will therefore require a Gigabit Ethernet switching infrastructure at a minimum.

For ease of installation, Power over Ethernet (PoE) switching is beneficial and should be considered if an Ethernet Switching refresh is required, however this is not a direct requirement of 802.11ac as Fortinet 802.11ac APs will also support PoE via power injector technology. Some AP models (such as the FAP-320C) will be powered by standard 15.4 W 802.3af PoE, however other high-power output APs (such as the FAP-322C) will require the higher power 25.5 W 802.3at PoE+.

**Which environments or use cases is 802.11ac best suited for?**

802.11ac is best suited for environment where high bandwidth and/or high density are required.

Some examples include:

- High bandwidth applications
  - Large file transfers (imaging)
  - Video distribution
  - Gaming
- High density environments
  - Education
  - Hospitals
  - Public networks

**Should I delay my wireless LAN refresh or installation project to wait for 802.11ac?**

It is important to understand that 802.11ac is coming and to consider the technology in future wireless decision making, however it will take a while for 802.11ac clients to become prevalent and for APs to support the full range of 802.11ac features. For example, multi-user MIMO is an important feature of 802.11ac; however this feature will not appear across the industry until sometime in 2014.

802.11n is now a mature standard and provides enough capacity for most environments and will be the most logical products to purchase for some time. A Fortinet wireless solution is future-proofed in that any FortiGate wireless controllers will support 802.11ac APs, so legacy APs can simply be swapped out for new 802.11ac APs when they are released.